General

Guideline Title

ACR Appropriateness Criteria® cranial neuropathy.

Bibliographic Source(s)

Policeni B, Burns J, Conley DB, Crowley RW, Harvey HB, Hoang J, Hunt CH, Jagadeesan BD, Juliano AF, Kennedy TA, Moonis G, Pannell JS, Patel ND, Perlmutter JS, Rosenow JM, Schroeder JW, Whitehead MT, Cornelius RS, Corey AS, Expert Panel on Neurologic Imaging. ACR Appropriateness CriteriaÂ® cranial neuropathy. Reston (VA): American College of Radiology (ACR); 2017. 22 p. [136 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Wippold FJ II, Cornelius RS, Aiken AH, Angtuaco EJ, Berger KL, Brown DC, Davis PC, Holloway K, McConnell CT Jr, Mechtler LL, Nussenbaum B, Rosenow JM, Roth CJ, Seidenwurm DJ, Slavin K, Waxman AD, Expert Panel on Neurologic Imaging. ACR Appropriateness Criteria® cranial neuropathy. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 18 p. [130 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report Clinical Practice Guidelines We Can Trust.

= Poor = Fair = Good = Very Good = Excellent

Assessment	Standard of Trustworthiness
YES	Disclosure of Guideline Funding Source
	Disclosure and Management of Financial Conflict of Interests

	Guideline Development Group Composition
YES	Multidisciplinary Group
YES	Methodologist Involvement
▮▯▯▯▯	Patient and Public Perspectives
	Use of a Systematic Review of Evidence
▮▮▮▮▮	Search Strategy
▮▮▮▮▯	Study Selection
▮▮▮▮▯	Synthesis of Evidence
	Evidence Foundations for and Rating Strength of Recommendations
▮▯▯▯▯	Grading the Quality or Strength of Evidence
▮▮▮▮▮	Benefits and Harms of Recommendations
▮▮▮▮▮	Evidence Summary Supporting Recommendations
▮▮▮▮▯	Rating the Strength of Recommendations
▮▮▮▮▮	Specific and Unambiguous Articulation of Recommendations
▮▯▯▯▯	External Review
▮▮▮▯▯	Updating

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Cranial Neuropathy

Variant 1: Anosmia and abnormalities of the sense of smell. (Olfactory nerve, CN I.)

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with IV contrast	8	This procedure is performed in conjunction with MRI of the orbit, face, and neck.	O
MRI orbit face neck without and with IV contrast	8	This procedure is performed in conjunction with MRI of the head.	O
MRI head without IV contrast	6		O
MRI orbit face neck without IV contrast	6		O
CT maxillofacial w/ IV	6		*Relative Radiation

Radiologic Procedure	Rating	Comments	RRL*
CT head with IV contrast	5		☢☢☢
CT head without IV contrast	5		☢☢☢
CT head without and with IV contrast	5		☢☢☢
CT maxillofacial without IV contrast	5		☢☢
CT maxillofacial without and with IV contrast	4		☢☢☢
FDG-PET/CT whole body	2		☢☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Weakness or paralysis of the mastication muscles. Sensory abnormalities of the head and neck. Trigeminal neuralgia. (Trigeminal nerve, CN V.)

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with IV contrast	8	This procedure is performed in conjunction with MRI of the orbit, face, and neck.	O
MRI orbit face neck without and with IV contrast	8	This procedure is performed in conjunction with MRI of the head.	O
MRI head without IV contrast	6		O
MRI orbit face neck without IV contrast	6		O
MRA head without IV contrast	6		O
CTA head with IV contrast	5		☢☢☢
CT head with IV contrast	5		☢☢☢
CT maxillofacial with IV contrast	5		☢☢
CT maxillofacial without IV contrast	5		☢☢
CT head without IV contrast	4		☢☢☢
CT head without and with IV contrast	4		☢☢☢
CT neck with IV contrast	4		☢☢☢
CT neck without IV contrast	4	Contrast-enhanced imaging is preferred.	☢☢☢
CT maxillofacial without and with IV contrast	4		☢☢☢
CT neck without and with IV contrast	3		☢☢☢
FDG-PET/CT whole body	2		☢☢☢☢
US neck	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Weakness or paralysis of facial expression. Hemifacial spasm. Bell palsy. (Facial nerve, CN VII.)

Radiologic Procedure	Rating	Comments	RRL*
MRI orbit face neck without and with IV contrast	9	This procedure is performed in conjunction with MRI of the head.	O
MRI head without and with IV contrast	8	This procedure is performed in conjunction with MRI of the orbit, face, and neck.	O
MRI head without IV contrast	5		O
MRI orbit face neck without IV contrast	5		O
CT head with IV contrast	5		☢☢☢
CT head without IV contrast	5		☢☢☢
CT head without and with IV contrast	4		☢☢☢
CT neck with IV contrast	4		☢☢☢
CT neck without IV contrast	3		☢☢☢
CT neck without and with IV contrast	3		☢☢☢
FDG-PET/CT whole body	2		☢☢☢☢
US neck	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Palate weakness. Oropharyngeal pain. (Glossopharyngeal nerve, CN IX.)

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with IV contrast	8	This procedure is performed in conjunction with MRI of the orbit, face, and neck.	O
MRI orbit face neck without and with IV contrast	8	This procedure is performed in conjunction with MRI of the head.	O
MRI head without IV contrast	6		O
MRI orbit face neck without IV contrast	6		O
CT neck with IV contrast	6		☢☢☢
CT head with IV contrast	5		☢☢☢
CT head without IV contrast	5	Contrast-enhanced imaging is preferred.	☢☢☢
CT neck without IV contrast	5	Contrast-enhanced imaging is preferred.	☢☢☢
CT head without and with IV contrast	4		☢☢☢
CT neck without and with IV contrast	4		☢☢☢
FDG-PET/CT whole body	2		☢☢☢☢
US neck	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually			*Relative

Radiologic Procedure	Rating	Comments	RRL*
	appropriate		Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: Vocal cord paralysis. (Vagal nerve, CN X.)

Radiologic Procedure	Rating	Comments	RRL*
MRI orbit face neck without and with IV contrast	8	This procedure is performed in conjunction with MRI of the head. CT of the neck is an alternative examination and in some instances can be complementary.	O
CT neck with IV contrast	8	MRI of the orbit, face, and neck can be an alternative examination and in some instances can be complementary.	☢☢☢
MRI head without and with IV contrast	7	This procedure is performed in conjunction with MRI of the orbit, face, and neck. CT of the neck can be useful to assess the extracranial course of CN X.	O
MRI head without IV contrast	6		O
MRI orbit face neck without IV contrast	6		O
CT chest with IV contrast	6		☢☢☢
MRI chest without and with IV contrast	5		O
CT head with IV contrast	5		☢☢☢
CT neck without IV contrast	5	Contrast-enhanced imaging is preferred.	☢☢☢
CT chest without IV contrast	5		☢☢☢
MRI chest without IV contrast	4		O
CT head without IV contrast	4		☢☢☢
CT head without and with IV contrast	4		☢☢☢
CT neck without and with IV contrast	4		☢☢☢
X-ray chest	4		☢
FDG-PET/CT whole body	4	This procedure is not a first-line examination.	☢☢☢☢
US neck	4		O
CT chest without and with IV contrast	3		☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 6: Weakness or paralysis of the sternocleidomastoid and trapezius muscles. (Accessory nerve, CN XI.)

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with	8	This procedure is performed in	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually			*Relative

Radiologic Procedure	Rating	Comments	RRL*
IV contrast		conjunction with MRI of the orbit, face, and neck.	
MRI orbit face neck without and with IV contrast	8	This procedure is performed in conjunction with MRI of the head. CT neck imaging can be complementary.	O
MRI orbit face neck without IV contrast	7	Contrast-enhanced imaging is preferred.	O
CT neck with IV contrast	7	MRI of the orbit, face, and neck can be an alternative examination and in some instances can be complementary.	☢☢☢
MRI head without IV contrast	6		O
CT head with IV contrast	6		☢☢☢
CT head without IV contrast	5		☢☢☢
CT head without and with IV contrast	5		☢☢☢
CT neck without IV contrast	5		☢☢☢
CT neck without and with IV contrast	5	The panel did not agree on a recommendation.	☢☢☢
FDG-PET/CT whole body	3		☢☢☢☢
US neck	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 7: Weakness or paralysis of the tongue. (Hypoglossal nerve, CN XII.)

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with IV contrast	8	This procedure is performed in conjunction with MRI of the orbit, face, and neck.	O
MRI orbit face neck without and with IV contrast	8	This procedure is performed in conjunction with MRI of the head.	O
CT neck with IV contrast	7	MRI of the orbit, face, and neck is preferred, but in some instances CT neck can be complementary.	☢☢☢
MRI head without IV contrast	6		O
MRI orbit face neck without IV contrast	6		O
CT head with IV contrast	5		☢☢☢
CT head without IV contrast	5		☢☢☢
CT head without and with IV contrast	4		☢☢☢
CT neck without IV contrast	4		☢☢☢
CT neck without and with IV contrast	4		☢☢☢
FDG-PET/CT whole body	2		☢☢☢☢
US neck	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 8: Perineural spread of tumor. (Most commonly trigeminal nerve [CN V], facial nerve [CN VII].)

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with IV contrast	9	This procedure is performed in conjunction with MRI of the orbit, face, and neck.	O
MRI orbit face neck without and with IV contrast	9	This procedure is performed in conjunction with MRI of the head.	O
MRI orbit face neck without IV contrast	7	Addition of contrast-enhanced imaging is preferred.	O
CT neck with IV contrast	6		☢☢☢
MRI head without IV contrast	5		O
CT head with IV contrast	5		☢☢☢
CT head without IV contrast	5		☢☢☢
CT neck without IV contrast	5		☢☢☢
CT head without and with IV contrast	4		☢☢☢
CT neck without and with IV contrast	4		☢☢☢
FDG-PET/CT whole body	4	This procedure is not a first-line examination.	☢☢☢☢
US neck	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

The cranial nerves arise from nuclei within the brain and brainstem and supply sensory and motor innervation to the head and neck region, whereas the spinal nerves arise from the spinal cord and supply the rest of the body. As a group, the cranial nerves have both sensory and motor components similar to those of the spinal nerves. Individually the cranial nerves may be purely sensory or purely motor or a mixture of both sensory and motor. Functions of the cranial nerves may be divided into 3 sensory and 3 motor categories. The sensory group includes visceral sensory, which supplies sensory input from the internal organs; general sensory, which supplies tactile, pain, temperature and other sensations; and special sensory, which includes the special senses of smell, vision, taste, hearing, and balance. Of the 3 motor functions, somatic motor innervates muscles that develop from the body somites; branchial motor innervates muscles derived from the branchial arches; and visceral motor innervates the viscera, glands, and smooth muscle.

Cranial nerves emerge in an orderly fashion from the rostral portion of the embryologically developing neural tube, which will subsequently mature to form the brain and brain stem. Anatomically, the 12 pairs of cranial nerves are designated by numbers and are organized most rostral to most caudal in descending order. The cranial nerves (CN) include the olfactory (CN I), optic (CN II), oculomotor (CN III), trochlear (CN IV), trigeminal (CN V), abducens (CN VI), facial (CN VII), vestibulocochlear (CN VIII), glossopharyngeal (CN IX), vagus (CN X), spinal accessory (CN XI), and hypoglossal (CN XII) nerves. The olfactory (CN I) and optic (CN II) nerves are actually tracts formed from the telencephalon and diencephalon, respectively, and are not considered true nerves. The optic (CN II), oculomotor (CN III), trochlear (CN IV), and abducens (CN VI) nerves are considered functionally to be part of the visual and

extraocular motor system and have been discussed in the National Guideline Clearinghouse (NGC) summary of the ACR Appropriateness Criteria® orbits, vision and visual loss. Also, the vestibulocochlear nerve (CN VIII) has been reviewed in the NGC summary of the ACR Appropriateness Criteria® hearing loss and/or vertigo. Therefore, this discussion will focus on cranial nerves CN I, CN V, CN VII, CN IX, CN X, CN XI, and CN XII.

In approaching cranial neuropathy, several concepts should be emphasized:

- Because of the complex anatomic structures within the brain and brainstem and because the cranial nerves may take long, circuitous routes to their destinations, a detailed knowledge of cranial nerve anatomy is essential for proper clinical localization of potential lesions and for appropriate application of specific imaging protocols.
- Because some individual nerve fibers, such as the autonomic nerves, may travel with several different cranial nerves from their nuclei of origin to their ultimate destinations, loss of a specific function may indicate involvement of potentially more than 1 cranial nerve.
- Because of the close proximity of many cranial nerve nuclei and of many exiting sites of the nerves themselves, some mass lesions may involve multiple cranial nerves.

Special Imaging Considerations

In the evaluation of cranial neuropathy complete evaluation of the nerves from their brainstem nuclei to their "end organs" must be performed. The pathology can be located in the nucleus, cisternae, and skull base segments of the cranial nerves. For cranial nerve VII, the lesion can also be located in the parotid. For cranial nerves IX, X, XI, and XII, the lesion can also be located in the neck. Evaluation of the upper chest is necessary for complete evaluation of the CN X (recurrent laryngeal) course. This can be accomplished by extending the neck scan into the mid thorax (aortic pulmonary window) or dedicated chest computed tomography (CT). Patients presenting with otalgia may require evaluation of CN V, VII, IX, and X and upper cervical nerves C2 and C3 since any of these nerves may be the source for the otalgia. The use of intravenous contrast is imperative for the evaluation of cranial neuropathy with magnetic resonance imaging (MRI). Neck CT also requires the utilization of contrast when evaluating pathology affecting the neck. Dual-phase CT before and after administration of contrast is rarely necessary. This should be avoided because of the extra radiation exposure and minimal added benefits.

The primary plane of study for head and neck evaluation of cranial neuropathy is usually the axial plane. Additional orthogonal planes are required depending upon the course of the various nerves. Coronal and sagittal reconstructions are typically performed on CT. In order to obtain high-resolution orthogonal reconstructions, the axial plane is acquired with thin sections, typically <1 mm. On MRI, orthogonal reconstructions are typically performed on the postcontrast T1-weighted images; however, they can also be obtained on T2-weighted images. Thin-section MRI images are required to evaluate the cisternal segment and should be performed.

High-field-strength magnets (1.5T–3.0T) are preferred to low-field-strength units because of achievable signal to noise ratios, gradient strength, and spatial resolution. A phased-array head coil suffices for most examinations; specialized surface coils may supplement examinations of peripherally located nerves.

Fundamental techniques include T1-weighted, T2-weighted, and enhanced T1-weighted imaging sequences. The unenhanced T1-weighted sequence remains an excellent baseline technique for anatomical evaluation because of the natural contrast provided by neck and skull base fat. Specialized versions of sequences may be available on scanners depending on manufacturer options. For example, various three-dimensional (3-D) and heavily T2-weighted sequences—such as constructive interference in steady state, 3-D–balanced fast field echo, 3-D–driven equilibrium radio frequency reset pulse, 3-D fast spin echo, fast imaging using steady-state acquisition, and 3-D fast spin-echo extended echo-train acquisition—may provide excellent spatial resolution of the cisternal segments of some of the cranial nerves, but they must be used judiciously because of potentially misleading artifacts. Enhanced fat-suppression T1-weighted techniques may emphasize abnormally enhancing lesions and nerves but may potentially mask subtle pathology if the suppression is nonuniform. Additional sequences, such as

diffusion-weighted imaging, may be added to evaluate specific pathologies, such as infarctions, or specific lesions, such as epidermoids, that may affect cranial nerve function. Slice thickness should be calculated for optimal spatial resolution without introducing partial-volume effect. Because cranial nerve examinations tend to be lengthy, strategies such as parallel imaging may improve patient compliance and image quality.

Discussion of Procedures by Variant

Variant 1: Anosmia and Abnormalities of the Sense of Smell. (Olfactory Nerve, CN I)

Abnormalities of the special sense of smell are mediated by the olfactory nerve (CN I) and can be grouped into clinical categories. Quantitative disturbances imply diminished or enhanced sense of smell (anosmia, hyposmia, or hyperosmia). Qualitative disturbances involve distortions of the sense of smell (dysosmia). Discrimination disturbances involve an inability to differentiate among various smells. Hallucinations or delusions in the sense of smell may also occur. The latter may be caused by temporal lobe dysfunction (see the NGC summary of the ACR Appropriateness Criteria® seizures and epilepsy) or by degenerative or psychiatric disease. Taste, mediated by the facial (CN VII) and glossopharyngeal (CN IX) nerves, may also be affected by pathology involving the olfactory nerve (CN I).

Most patients with olfactory complaints do not require imaging. Chronic tobacco use, upper respiratory infections, and inflammatory conditions most commonly affect the sense of smell. More serious conditions affecting the olfactory nerve include trauma (the olfactory nerve is the nerve most commonly disrupted by trauma); cribriform plate tumors such as invasive squamous cell carcinomas of the paranasal sinuses, meningiomas, and esthesioneuroblastomas; inflammatory lesions such as sarcoidosis and granulomatosis with polyangiitis (formerly known as Wegener granulomatosis); and congenital conditions such as cephaloceles and Kallmann syndrome. Recent investigations have focused on olfactory bulb volume as an indicator of olfactory dysfunction and even a marker for such disorders as early Parkinson disease and depression.

Magnetic Resonance Imaging and Computed Tomography

MRI is the mainstay for examining the olfactory apparatus, although CT remains useful when evaluating fractures, paranasal sinus inflammatory disease, and bony anatomy. Imaging protocols should cover the major anatomic divisions of the olfactory nerve and pathway, including the olfactory epithelium, which is located in the upper nasal cavity; the olfactory neurons and bulbs, located in the cribriform plate and inferior frontal lobes; and the olfactory pathways, which travel in portions of the temporal and frontal lobes.

FDG-PET/CT and Other Imaging Modalities

Efforts using functional MRI, single-photon emission CT, and fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET) in studying olfactory dysfunction remain largely investigative and are not generally used in routine evaluations.

Variant 2: Weakness or Paralysis of the Mastication Muscles. Sensory Abnormalities of the Head and Neck. Trigeminal Neuralgia. (Trigeminal Nerve, CN V)

The trigeminal nerve (CN V) provides general sensation to large portions of the head and neck and branchial motor innervation to the muscles of mastication. It is the largest cranial nerve and is divided into 3 main divisions, known as the ophthalmic (V1), maxillary (V2), and mandibular (V3) branches. Symptoms largely depend on the involved segment and division. Abnormalities of the nerve may manifest as sensory disturbances, such as trigeminal neuralgia (*tic douloureux*), facial numbness, or motor abnormalities such as weakness when chewing food.

The trigeminal nerve (CN V) is the nerve of the first branchial arch and may be involved in congenital conditions such as Goldenhar-Gorlin syndrome. Intra-axial and extra-axial processes may affect the brainstem trigeminal nuclei and nerve root entry and exit zones. Conditions localized to the brainstem portion of the trigeminal nerve (CN V) include vascular lesions (such as compressing vascular loops,

aneurysms, vertebrobasilar dolichoectasia, and infarctions), inflammatory and infectious conditions (such as meningitis, encephalitis, sarcoidosis, and multiple sclerosis), and tumors (such as gliomas, lymphomas, metastases, and meningiomas). The cisternal portion of the nerve may be especially vulnerable to compression from adjacent vascular loops, causing trigeminal neuralgia. Tumors, vascular lesions, and inflammatory processes may also affect the branches of the nerve as they traverse the Meckel cave, the pterygopalatine fossa, the orbit, the skull base, and the masticator space.

Magnetic Resonance Imaging and Computed Tomography

MRI is the preferred modality for investigating the trigeminal nerve (CN V). CT is very useful for evaluating the skull base and neural foramina. Three-dimensional and heavily T2-weighted magnetic resonance (MR) sequences and MR and CT angiography are helpful noninvasive methods for reviewing the anatomy of potentially compressing vascular loops. Patients may benefit from MRI studies performed in a high-strength magnet (3T), given the higher anatomic resolution. With the growing popularity of radiosurgery, such as gamma knife procedures, and radiofrequency thermocoagulation in the treatment of trigeminal neuralgia, both CT and MRI have become indispensable planning and follow-up tools, although imaging may not reliably predict outcome. Because of the complex branching patterns of the nerve, multiple imaging planes are essential.

Ultrasound

US is not routinely used in the initial evaluation of the trigeminal nerve.

FDG-PET/CT

PET is not routinely used in the initial evaluation of the trigeminal nerve.

Advanced Imaging Modalities

Advanced imaging applications, such as fractional anisotropy derived from diffusion tensor imaging and virtual endoscopy, are promising future directions in investigating trigeminal neuralgia.

Variant 3: Weakness or Paralysis of Facial Expression. Hemifacial Spasm. Bell Palsy. (Facial Nerve, CN VII)

The facial nerve (CN VII) is one of the most complex cranial nerves and contains branchial motor (innervation to the muscles of facial expression), visceral motor (parasympathetic innervation to most of the glands of the head), general sensory (surface innervations to a small portion of the external ear and tympanic membrane), and special sensory (taste to the anterior two-thirds of the tongue) functions. It is the one of the most commonly paralyzed nerves in the body, and most of the clinical attention it receives focuses on its role in facial expression. Tinnitus, conductive and sensorineural hearing loss, and hemifacial spasm may also signal a lesion involving the facial nerve.

The intracranial course of the facial nerve includes pontine, cisternal, and intratemporal segments. Within the pons, the facial nuclei can be affected by intra-axial conditions such as infarction, vascular malformations, tumors, and multiple sclerosis. As the nerve exits the brainstem and courses through the temporal bone, it may be affected by facial and vestibular schwannomas, meningiomas, vascular lesions, inflammation, cholesteatomas, paragangliomas, trauma, and intrinsic bone tumors. The extracranial segment of the facial nerve courses through the parotid gland and may be affected by parotid tumors and inflammation and conditions of the neighboring anatomic spaces and skull base such as carcinomas, sarcomas, trauma, and inflammatory disease.

Magnetic Resonance Imaging

MRI is the mainstay of evaluating both intracranial and extracranial portions of the facial nerve. Facial paralysis in the form of Bell palsy is one of the most common syndromes confronting the otolaryngologist. In general, Bell palsy patients need not be imaged unless the symptoms are atypical or persist for >2 months. When imaging is considered, MRI is the method of choice. Enhancement may be seen in the canalicular, labyrinthine, geniculate, tympanic, and mastoid portions of the nerve in neuritis, although

geniculate, tympanic, and mastoid portions may enhance normally. MRI may also be useful in establishing prognosis; however, there is 1 current study with a small cohort of patients that shows no association between the degree of enhancement and the clinical severity of facial nerve palsy in the early stage, stating that predicting the prognosis is difficult.

Computed Tomography

CT provides useful information regarding temporal bone fractures and trauma, presurgical osseous anatomy, nerve involvement with inflammatory middle ear disease, foraminal expansion, patterns of bone erosion, and intrinsic bone tumor matrices. In patients with risk of contrast allergy and contrast-induced nephropathy, a noncontrast CT may be sufficient if patients cannot undergo MRI. A dedicated temporal bone CT with thin sections should be obtained instead of a head CT to evaluate the course of CN VII.

Ultrasound

US is not routinely used in the initial evaluation of the facial nerve.

FDG-PET/CT

PET is not routinely used in the initial evaluation of the facial nerve.

Variant 4: Palate Weakness. Oropharyngeal Pain. (Glossopharyngeal Nerve, CN IX)

The glossopharyngeal nerve (CN IX) arises in the medulla and is responsible for branchial motor innervation to the stylopharyngeus muscle, which elevates the palate, and visceral motor parasympathetic innervation to the parotid gland. Visceral sensory innervation to the carotid sinus plays a role in regulating circulation and general and special sensory functions that supply sensation and taste to the posterior tongue. The nerve exits the jugular foramen in close proximity to the vagus (CN X) and the spinal accessory (CN XI) nerves. Therefore, isolated syndromes involving the glossopharyngeal nerve are rare. Intra-axial lesions include gliomas, lymphomas, metastases, vascular malformations, infarctions, and inflammatory abnormalities. Multiple sclerosis may also affect the medulla adjacent to the cranial nerve nuclei. Leptomeningeal metastases, granulomatous disease, and even tortuous or aneurysmal dilatation of vessels may affect the nerve as it enters the cistern. Lesions in the region of the posterior skull base and jugular foramen, such as metastases, schwannomas, paragangliomas, and meningiomas, usually also involve the other lower cranial nerves. Tonsillar pain syndromes, palate weakness, and loss of gag reflex accompanied by loss of taste and sensation in the posterior pharynx may signal a glossopharyngeal nerve lesion.

Magnetic Resonance Imaging and Computed Tomography

As with the other cranial nerves, MRI of CN IX is the preferred modality for investigating possible lesions such as masses or vascular compression, with CT providing information on the bony integrity of the foramina. Imaging protocols should focus on the posterior skull base and upper neck.

Ultrasound

US is not routinely used in the initial evaluation of the glossopharyngeal nerve.

FDG-PET/CT

PET is not routinely used in the initial evaluation of the glossopharyngeal nerve.

Variant 5: Vocal Cord Paralysis. (Vagal Nerve, CN X)

The vagus nerve (CN X) supplies visceral sensation to the pharynx, larynx, and viscera and general sensation to the ear. Branchial motor branches innervate muscles of the pharynx and larynx, whereas visceral motor branches play a predominant role in parasympathetic supply to the thorax and abdomen. The vagus nerve boasts the longest course in the body of any cranial nerve and is therefore vulnerable to a wide range of pathologies occurring throughout its trajectory from the posterior fossa and skull base to the neck, thorax, and abdomen. Intracranial processes such as meningiomas, schwannomas, metastases,

granulomatous disease, ischemia, vascular conditions, and infection may affect the vagal nuclei and the nerve as it exits the medulla. Paragangliomas, schwannomas, and metastases involving the skull base may affect the nerve and the neighboring glossopharyngeal nerve (CN IX) by infiltration of fibers or by compression. Within the neck, trauma may also affect the vagus nerve, in addition to masses, vascular lesions, thyroid conditions, infection, or inflammation. Viral neuropathy may be one of the most common causes of idiopathic vagal palsies.

One of the most troubling symptoms of vagus dysfunction is vocal cord paralysis. Because lesions anywhere in the long course of the nerve may potentially cause paralysis, the imaging protocol must visualize the full extent of the nerve from the skull base to the mid chest.

Magnetic Resonance Imaging, Computed Tomography, and Radiography

With its rapid scanning time and availability, CT provides an excellent means of examining the lower course of the nerve. Moreover, thoracic causes of paralysis, such as lung cancer, tuberculosis, and thoracic aortic aneurysm, are common. Although chest radiographs may detect many of these causes, chest CT is more sensitive, especially for lesions concealed in the aortopulmonary window. This can also be accomplished by extending the neck CT scanning to the mid thorax. For imaging of the upper course of the nerve including the skull base, MRI is preferred. For the mid neck and larynx, CT and MRI complement one another. For example, CT may differentiate traumatic arytenoid dislocation from neurogenic paralysis. Rapid multislice CT scanning, including functional 3-D applications, also allows the patient to perform phonation and breathing maneuvers during imaging to augment diagnosis. In patients with risk of contrast allergy and contrast-induced nephropathy, a noncontrast CT may be sufficient if patients cannot undergo MRI.

Ultrasound

US may also have a role in imaging of the neck. It may be useful for assessing lesions such as tumors or lymphadenopathy that have caused CN X neuropathy. It can be utilized in cases of neck lesions as a problem-solving technique. It can also be used as a technique to guide biopsies of lesions in the neck.

FDG-PET/CT

PET imaging used for evaluating head and neck malignancy may yield false-positive findings in the larynx for patients with vocal cord paralysis or unrecognized physiological asymmetry. It may be useful as a problem-solving technique following initial cross-sectional imaging in patients with a known primary malignancy. PET/CT may also be superior to cross-sectional imaging for both localization and determination of response to therapy.

Radiographs

Chest radiographs can be utilized as a screening tool if chest CT or chest MRI is unavailable or contraindicated. It can reveal lesions in the lung apex or mediastinum that may cause CN X deficits.

Variant 6: Weakness or Paralysis of the Sternocleidomastoid and Trapezius Muscles. (Accessory Nerve, CN XI)

The spinal accessory nerve (CN XI) supplies the sternocleidomastoid muscle and the upper portion of the trapezius muscle as its sole branchial motor function. Palsy is clinically manifested by weakness and atrophy of these muscles and may be accompanied by evidence of involvement of the glossopharyngeal (CN IX) and vagus (CN X) nerves in combined syndromes. Loss of volume and fatty infiltration of the sternocleidomastoid and trapezius muscles may be noted on imaging.

Magnetic Resonance Imaging and Computed Tomography

CT and MRI are complementary in diagnosing conditions such as posterior fossa and skull base infarctions, vascular lesions, Chiari malformations, paragangliomas, schwannomas, meningiomas, and metastases or in recognizing nerve involvement from prior neck surgeries. In patients with risk of contrast allergy and contrast-induced nephropathy, a noncontrast CT may be sufficient if patients cannot undergo

MRI. Protocol with thin-section MRI should be performed to evaluate the cranial nerves.

Ultrasound

US is not routinely used in the initial evaluation of the accessory nerve.

FDG-PET/CT

PET is not routinely used in the initial evaluation of the accessory nerve.

Variant 7: Weakness or Paralysis of the Tongue. (Hypoglossal Nerve, CN XII)

The hypoglossal nerve (CN XII) supplies somatic motor innervation to the intrinsic and extrinsic muscles of the tongue, except the palatoglossus muscle. Palsy of this nerve is recognized by dysarthria and deviation of the tongue to the affected side on protrusion. Atrophy and fatty infiltration of the tongue may be noted on imaging. Lesions of the posterior fossa, skull base, upper neck, and floor of the mouth may affect the hypoglossal nerve. They include infarctions, meningiomas, schwannomas, paragangliomas, carcinomas, metastases, subarachnoid hemorrhage, Chiari malformations, basilar invagination, and fractures.

Magnetic Resonance Imaging and Computed Tomography

As with the other lower cranial nerves, MRI is the preferred modality for CN XII, and CT provides complementary information on the integrity of the bony structures and foramina. Evaluation of the entire course of the nerve is required, which includes evaluation of the nucleus in the brainstem medulla and the nerve in the cisternal segment and high carotid space. This is preferably obtained with a neck MRI that covers the entire nerve pathway. In patients with risk of contrast allergy and contrast-induced nephropathy, a noncontrast CT may be sufficient if patients cannot undergo MRI.

Ultrasound

US is not routinely used in the initial evaluation of the hypoglossal nerve.

FDG-PET/CT

PET is not routinely used in the initial evaluation of the hypoglossal nerve.

Variant 8: Perineural Spread of Tumor. (Most Commonly Trigeminal Nerve [CN V], Facial Nerve [CN VII])

Because of the complex anatomy of the head and neck and the close proximity of several cranial nerves, many clinical presentations of cranial neuropathy involve multiple nerves. As in syndromes of combined neuropathy of the upper cranial nerves, such as those related to vision and the extraocular muscles (which are covered in other Appropriateness Criteria), syndromes involving the lower cranial nerves are also grouped primarily by the proximity of the involved cranial nerves. For example, Gradenigo syndrome involves CNs V and VI as they travel in the vicinity of the petrous apex, whereas Vernet syndrome involves CNs IX, X, and XI as they travel within the jugular foramen. Collet-Sicard syndrome involves CNs IX, X, XI, and XII related to lesions just below the skull base or large lesions affecting both the jugular foramen and the hypoglossal canal. Imaging protocols should be tailored to evaluate the suspected region of anatomy when the syndrome is identified by the clinician.

A difficult problem for the surgeon is the perineural spread of head and neck malignancy. The trigeminal (CN V) and facial (CN VII) are the most common nerves involved; however, any cranial nerve traveling in the vicinity of a malignancy may become involved. Perineural spread of tumor along the facial nerve may evade even the most meticulous imaging. Subtle clues such as nerve enhancement, nerve enlargement, foraminal expansion, or muscle volume loss may indicate cranial nerve involvement with tumor. For example, asymmetry of facial musculature may be useful in detecting perineural tumor spread along the facial nerve or predicting return of function after nerve grafting.

Magnetic Resonance Imaging and Computed Tomography

MRI has emerged as the preferred imaging method for evaluating the perineural spread of tumor,

although CT may be very useful for visualizing the neural foramina. In patients with risk of contrast allergy and contrast-induced nephropathy, a noncontrast CT may be sufficient if patients cannot undergo MRI. Protocol with thin-section MRI should be performed to evaluate the cranial nerves.

FDG-PET/CT

PET imaging may also be helpful. It may be useful as a problem-solving technique following initial cross-sectional imaging in patients with a known primary malignancy. PET/CT may also be superior to cross-sectional imaging for both localization and determination of response to therapy.

Ultrasound

US is not routinely used in the initial evaluation of the perineural spread of tumor.

Summary of Recommendations

Pathology affecting the olfactory nerve is best evaluated with contrast-enhanced MRI. The protocol should be tailored to the anterior cranial fossa. CT may be useful in the evaluation of sinus inflammatory disease and trauma.
Contrast-enhanced MRI is the primary technique to evaluate trigeminal neuralgia. MR angiography can be used to evaluate vascular compression.
Facial nerve neuropathy is best evaluated with a dedicated contrast-enhanced MRI of the orbit, face, and neck, tailored to the temporal bone and parotid area.
In the evaluation of cranial nerve IX symptoms, a focused contrast-enhanced MRI tailored to the posterior fossa is the study of choice.
Cranial nerve X paralysis is well evaluated with either contrast-enhanced MRI or contrast-enhanced neck CT. Pathology in the posterior fossa will be better demonstrated with MRI. The complete evaluation of the nerve requires imaging the upper chest to the level of the anteroposterior window.
In the evaluation of cranial nerve XI symptoms, a focused contrast-enhanced MRI tailored to the posterior fossa is the study of choice. Contrast-enhanced CT of the neck is complementary to the skull base imaging.
Evaluation of lesions affecting cranial nerve XII is best done with a contrast-enhanced MRI tailored to the posterior fossa. The evaluation of the neck can also be done with contrast-enhanced neck CT.
Perineural tumor spread most commonly affects CNs V and VII. Evaluation is best done with contrast-enhanced MRI tailored to the skull base.

Abbreviations

CN, cranial nerve
CT, computed tomography
CTA, computed tomography angiography
FDG-PET, fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography
IV, intravenous
MRA, magnetic resonance angiography
MRI, magnetic resonance imaging
US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢☢	0.1-1 mSv	0.03-0.3 mSv
☢☢☢	1-10 mSv	0.3-3 mSv
☢☢☢☢	10-30 mSv	3-10 mSv

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
☢☢☢☢☢	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Cranial neuropathy

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Family Practice

Internal Medicine

Neurological Surgery

Neurology

Oncology

Otolaryngology

Radiology

Intended Users

Advanced Practice Nurses

Health Care Providers

Health Plans

Hospitals

Managed Care Organizations

Physician Assistants

Physicians

Students

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of imaging procedures for patients with cranial neuropathy

Target Population

Patients with cranial neuropathy

Interventions and Practices Considered

1. Magnetic resonance imaging (MRI)
    - Head without and with intravenous (IV) contrast
    - Head without IV contrast
    - Orbit face neck without and with IV contrast
    - Orbit face neck without IV contrast
    - Chest without and with IV contrast
    - Chest without IV contrast
2. Magnetic resonance angiography, head without IV contrast
3. Computed tomography (CT)
    - Maxillofacial with IV contrast
    - Maxillofacial without IV contrast
    - Maxillofacial without and with IV contrast
    - Head with IV contrast
    - Head without IV contrast
    - Head without and with IV contrast
    - Neck with IV contrast
    - Neck without IV contrast
    - Neck without and with IV contrast
    - Chest with IV contrast
    - Chest without IV contrast
    - Chest without and with IV contrast
4. Computed tomography angiography, head with IV contrast
5. Fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET)/CT, whole body
6. Ultrasound (US), neck
7. X-ray, chest

Major Outcomes Considered

- Utility of imaging procedures in the diagnosis and evaluation of cranial neuropathies
- Sensitivity, specificity, and accuracy of imaging procedures in the diagnosis and evaluation of cranial neuropathies

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Summary

Of the 130 citations in the original bibliography, 117 were retained in the final document.

A literature search was conducted in April 2015 and March 2017 to identify additional evidence published since the *ACR Appropriateness Criteria® Cranial Neuropathy* topic was finalized. Using the search strategies described in the literature search companion (see the "Availability of Companion Documents" field), 559 articles were found. Thirteen articles were added to the bibliography. The remaining articles were not used due to either poor study design, the articles were not relevant or generalizable to the topic, or the results were unclear or biased.

The author added 2 citations from bibliographies, Web sites, or books that were not found in the literature searches that were found outside of the search date ranges.

Four citations are supporting documents that were added by staff.

See also the American College of Radiology (ACR) Appropriateness Criteria® literature search process document (see the "Availability of Companion Documents" field) for further information.

Number of Source Documents

Of the 130 citations in the original bibliography, 117 were retained in the final document. The literature search conducted in April 2015 and March 2017 identified 13 articles that were added to the bibliography. The author added 2 citations from bibliographies, Web sites, or books that were not found in the literature searches that were found outside of the search date ranges. Four citations are supporting documents that were added by staff.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Definitions of Study Quality Categories

Category 1 - The study is well-designed and accounts for common biases.

Category 2 - The study is moderately well-designed and accounts for most common biases.

Category 3 - The study has important study design limitations.

Category 4 - The study or source is not useful as primary evidence. The article may not be a clinical study, the study design is invalid, or conclusions are based on expert consensus.

> The study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
>
> *Or*
>
> The study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;

Or

The study is an expert opinion or consensus document.

Category M - Meta-analysis studies are not rated for study quality using the study element method because the method is designed to evaluate individual studies only. An "M" for the study quality will indicate that the study quality has not been evaluated for the meta-analysis study.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author assesses the literature then drafts or revises the narrative summarizing the evidence found in the literature. American College of Radiology (ACR) staff drafts an evidence table based on the analysis of the selected literature. These tables rate the study quality for each article included in the narrative.

The expert panel reviews the narrative, evidence table and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the variant table(s). Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Rating Appropriateness

The American College of Radiology (ACR) Appropriateness Criteria (AC) methodology is based on the RAND Appropriateness Method. The appropriateness ratings for each of the procedures or treatments included in the AC topics are determined using a modified Delphi method. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. The expert panel members review the evidence presented and assess the risks or harms of doing the procedure balanced with the benefits of performing the procedure. The direct or indirect costs of a procedure are not considered as a risk or harm when determining appropriateness. When the evidence for a specific topic and variant is uncertain or incomplete, expert opinion may supplement the available evidence or may be the sole source for assessing the appropriateness.

The appropriateness is represented on an ordinal scale that uses integers from 1 to 9 grouped into three categories: 1, 2, or 3 are in the category "usually not appropriate" where the harms of doing the procedure outweigh the benefits; and 7, 8, or 9 are in the category "usually appropriate" where the benefits of doing a procedure outweigh the harms or risks. The middle category, designated "may be appropriate," is represented by 4, 5, or 6 on the scale. The middle category is when the risks and benefits are equivocal or unclear, the dispersion of the individual ratings from the group median rating is too large (i.e., disagreement), the evidence is contradictory or unclear, or there are special circumstances or subpopulations which could influence the risks or benefits that are embedded in the variant.

The ratings assigned by each panel member are presented in a table displaying the frequency distribution of the ratings without identifying which members provided any particular rating. To determine the panel's recommendation, the rating category that contains the median group rating without disagreement is selected. This may be determined after either the first or second rating round. If there is disagreement after the first rating round, a conference call is scheduled to discuss the evidence and, if needed, clarify the variant or procedure description. If there is disagreement after the second rating round, the recommendation is "May be appropriate."

This modified Delphi method enables each panelist to articulate his or her individual interpretations of the evidence or expert opinion without excessive influence from fellow panelists in a simple, standardized, and economical process. For additional information on the ratings process see the Rating Round Information document.

Additional methodology documents, including a more detailed explanation of the complete topic development process and all ACR AC topics can be found on the ACR Web site (see also the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current medical evidence literature and the application of the RAND/UCLA appropriateness method and expert panel consensus.

Summary of Evidence

Of the 136 references cited in the *ACR Appropriateness Criteria® Cranial Neuropathy* document, 2 are categorized as therapeutic references, including 1 good-quality study. Additionally, 134 references are categorized as diagnostic references, including 3 well-designed studies, 19 good-quality studies, and 46 quality studies that may have design limitations. There are 67 references that may not be useful as primary evidence.

Although there are references that report on studies with design limitations, 23 well-designed or good-quality studies provide good evidence.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Use of appropriate imaging procedures in the diagnosis and evaluation of cranial neuropathies

Potential Harms

Positron emission tomography (PET) imaging used for evaluating head and neck malignancy may yield false positive findings in the larynx for patients with vocal cord paralysis or unrecognized physiological asymmetry.

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the American College of Radiology (ACR) Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

- The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.
- ACR seeks and encourages collaboration with other organizations on the development of the ACR Appropriateness Criteria through society representation on expert panels. Participation by representatives from collaborating societies on the expert panel does not necessarily imply individual or society endorsement of the final document.
- The views expressed in this manuscript are those of the author and do not reflect the official policy of the Department of Army/Navy/Air Force, Department of Defense, or United States Government.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Policeni B, Burns J, Conley DB, Crowley RW, Harvey HB, Hoang J, Hunt CH, Jagadeesan BD, Juliano AF, Kennedy TA, Moonis G, Pannell JS, Patel ND, Perlmutter JS, Rosenow JM, Schroeder JW, Whitehead MT, Cornelius RS, Corey AS, Expert Panel on Neurologic Imaging. ACR Appropriateness CriteriaÂ® cranial neuropathy. Reston (VA): American College of Radiology (ACR); 2017. 22 p. [136 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2017

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Neurologic Imaging

Composition of Group That Authored the Guideline

Panel Members: Bruno Policeni, MD (*Principal Author and Panel Vice-chair*); Judah Burns, MD; David B. Conley, MD; R. Webster Crowley, MD; H. Benjamin Harvey, MD, JD; Jenny Hoang, MBBS; Christopher H. Hunt, MD; Bharathi D. Jagadeesan, MD; Amy F. Juliano, MD; Tabassum A. Kennedy, MD; Gul Moonis, MD; Jeffrey S. Pannell, MD; Nandini D. Patel, MD; Joel S. Perlmutter, MD; Joshua M. Rosenow, MD; Jason W. Schroeder, MD; Matthew T. Whitehead, MD; Rebecca S. Cornelius, MD (*Specialty Chair*); Amanda S. Corey, MD (*Panel Chair*)

Financial Disclosures/Conflicts of Interest

All panel members, authors, and chairs must complete a Conflict of Interest and Expertise Survey annually, disclosing any actual or potential conflicts related to duties and responsibilities on the panel.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Wippold FJ II, Cornelius RS, Aiken AH, Angtuaco EJ, Berger KL, Brown DC, Davis PC, Holloway K, McConnell CT Jr, Mechtler LL, Nussenbaum B, Rosenow JM, Roth CJ, Seidenwurm DJ, Slavin K, Waxman AD, Expert Panel on Neurologic Imaging. ACR Appropriateness Criteria® cranial neuropathy. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 18 p. [130 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the American College of Radiology (ACR) Web site.

Availability of Companion Documents

The following are available:

ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2015 Oct. 3 p. Available from the American College of Radiology (ACR) Web site.
ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2015 Feb. 1 p. Available from the ACR Web site.
ACR Appropriateness Criteria®. Evidence table development. Reston (VA): American College of Radiology; 2015 Nov. 5 p. Available from the ACR Web site.
ACR Appropriateness Criteria®. Topic development process. Reston (VA): American College of Radiology; 2015 Nov. 2 p. Available from the ACR Web site.
ACR Appropriateness Criteria®. Rating round information. Reston (VA): American College of Radiology; 2015 Apr. 5 p. Available from the ACR Web site.
ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2017. 4 p. Available from the ACR Web site.
ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 2017. 125 p. Available from the ACR Web site.
ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology;

2017 Mar. 4 p. Available from the ACR Web site .
ACR Appropriateness Criteria® cranial neuropathy. Evidence table. Reston (VA): American College of Radiology; 2017. 34 p. Available from the ACR Web site .
ACR Appropriateness Criteria® cranial neuropathy. Literature search. Reston (VA): American College of Radiology; 2017. 2 p. Available from the ACR Web site .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on December 10, 2010. This summary was updated by ECRI Institute on November 14, 2012. This summary was updated by ECRI Institute on June 23, 2017.

This NEATS assessment was completed by ECRI Institute on June 28, 2017. The information was verified by the guideline developer on July 25, 2017.

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